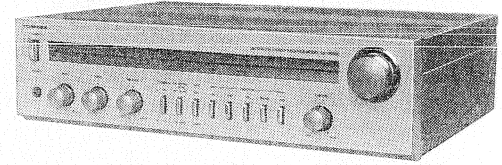
SERVICE DATA
FILE NO. 150-156

TOSHIBA

LW/MW/FM STEREO RECEIVER

SA-2000L



SPECIFICATIONS

■ AMPLIFIER SECTION

Power output	
40 Hz ~ 20 kHz both channel driven:	20W x 2 8 ohms 22W x 2 4 ohms
1 kHz both channel driven:	22W x 2 8 ohms 25W x 2 4 ohms
Total harmonic distortion:	at 8 ohms
Rated power output:	0.15%
Intermodulation distortion:	0.15%
Damping factor:	30
Input (Sensitivity/Impedance)	
PHONO:	2.5 mV/47K ohms
AUX:	150 mV/47K ohms
TAPE:	150 mV/47K ohms
PHONO overload level:	100 mV rms at 1 kHz
Output level	
TAPE REC:	150 mV
Frequency response	
PHONO (RIAA equalization):	30 Hz to 15 kHz ±0.5 dB
AUX, TAPE:	10 Hz to 40 kHz $^{+1}_{-2}$ dB
Tone control	
BASS:	±8 dB, (100 Hz)
TREBLE:	±8 dB, (10 kHz)
Loudness contour:	+8 dB (100 Hz), +4 dB (10 kHz)
Signal to Noise Ratio (IHF short-circuited A network, rated power)	
PHONO:	70 dB
AUX, TAPE:	90 dB

■ FM TUNER SECTION

Usable sensitivity:	Mono 2.5μV (300 ohms) (S/N 26 dB, 40 kHz dev.)
Signal to noise ratio (40 kHz dev.):	Mono 68 dB
Distortion	
1 kHz:	Mono 0.3%
Frequency response:	20 Hz to 15 kHz +0.5 dB, -2 dB
Capture ratio:	1.5 dB
Alternate channel selectivity:	65 dB (±300 kHz)
Spurious response ratio:	70 dB
Image rejection ratio:	50 dB
IF rejection ratio:	60 dB
AM suppression ratio:	50 dB
Stereo separation:	35 dB (1 kHz)

■ LW/MW TUNER SECTION

Sensitivity:	MW: 350μV/m LW: 800μV/m (ferrite antenna)
Selectivity:	35 dB
Signal to noise ratio:	45 dB
Image rejection ratio:	40 dB

■ MISCELLANEOUS

Power requirements:	220V ~ 50 Hz
Power consumption:	180 watts
Dimensions (W x H x D):	420 x 116 x 335 (mm)
Weight:	5.5 kg

Specifications are subject to change without notice.

TE

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1. CONNECTION DIAGRAM

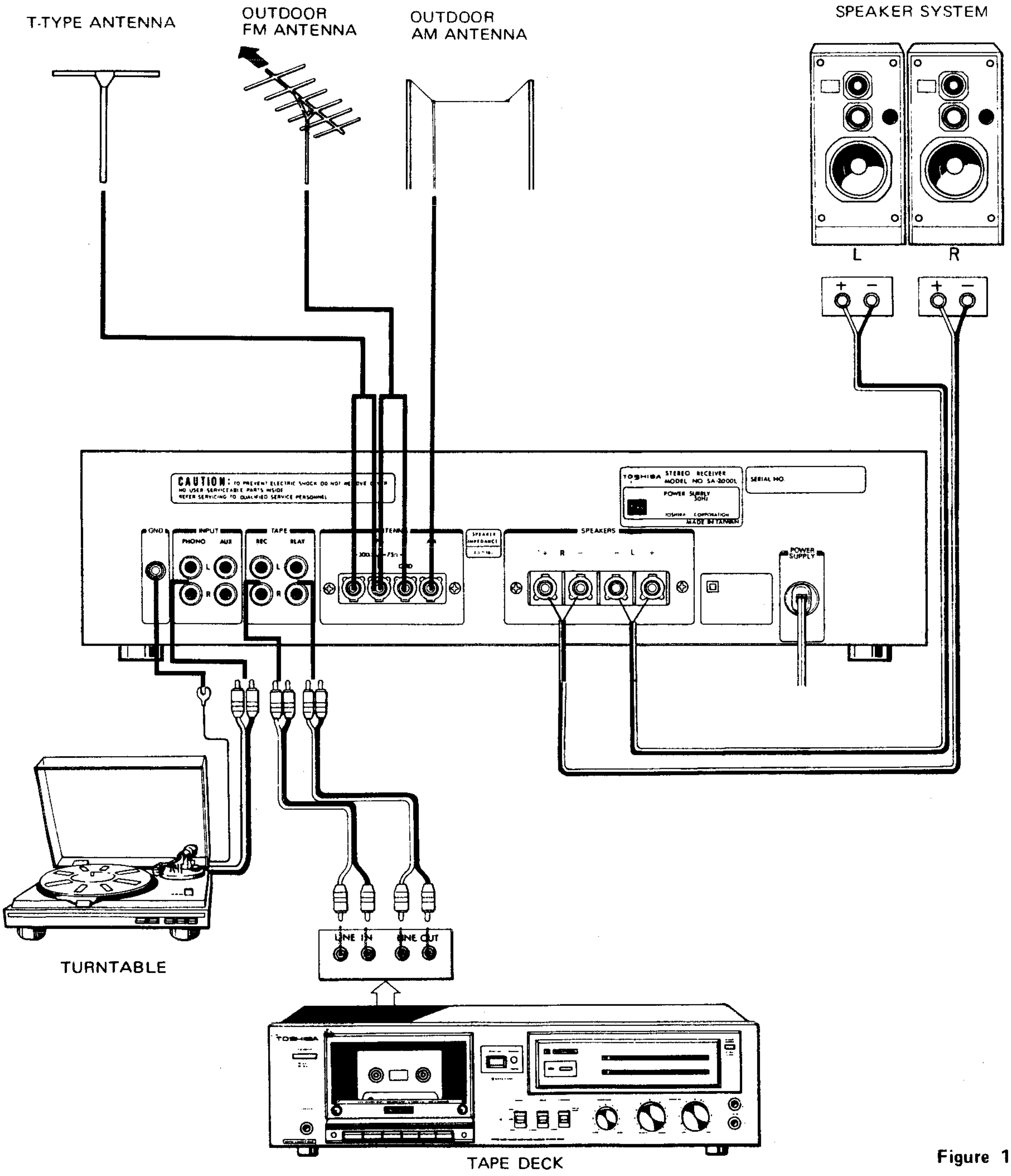

T-TYPE ANTENNA
OUTDOOR FM ANTENNA
OUTDOOR AM ANTENNA
SPEAKER SYSTEM
L
R
CAUTION
GND
INPUT
PHONO
AUX
TAPE
REC
PLAY
SPEAKERS
POWER SUPPLY
TURNTABLE
LINE IN
LINE OUT
TAPE DECK

Figure 1.

2. OPERATING CONTROLS

■ TUNING INDICATOR

For FM tuning, tune in your station and make fine adjustments until the green LED lamp comes on. This indicates that you are aligned precisely with the signal which will produce the best-quality.
This indicator does not operate for AM reception.

■ SIGNAL INDICATOR

These LEDs light up to indicate the strength of the signal being received, more LEDs lighting up for increasingly stronger signals.

■ FM STEREO INDICATOR

This lights up when a stereophonic FM broadcast is received.

■ TUNING POINTER

This pointer indicates the frequency to which the unit is tuned.

■ POWER SWITCH

Depress this switch to turn on power; depress once more to turn power off.

■ PHONES JACK

Used for connecting stereo headphones. A wide variety of high quality headphones is available from TOSHIBA.

■ BASS AND TREBLE CONTROLS

Adjust for desired bass and treble tone response. Leave both controls in the center 0 position for a flat tone response. Turn clockwise to boost, and counterclockwise to diminish tone response by up to 8 dB.

■ BALANCE CONTROL

Adjust left and right channel balance depending on listening room conditions. When this control is turned clockwise, the left channel is decreased, and when turned counterclockwise, the right channel is decreased.

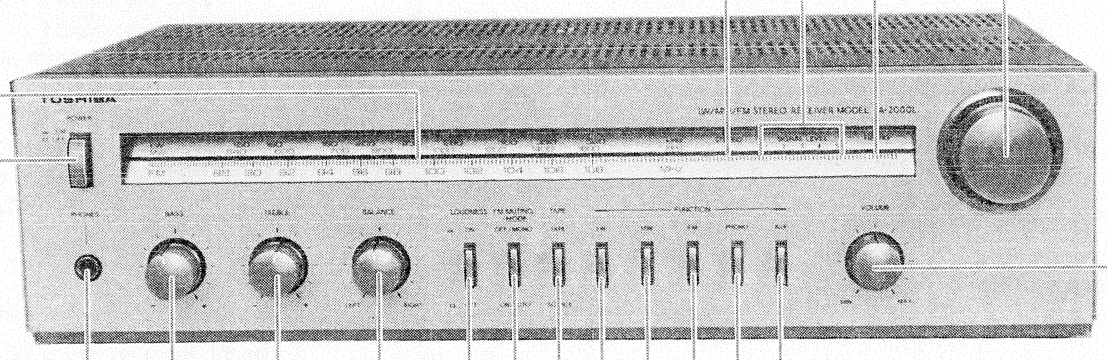


Figure 2.

■ TUNING KNOB

Turn this knob to tune in the frequency of a desired AM or FM broadcast station.

■ VOLUME CONTROL

For adjusting the volume level of the speakers and headphones.

■ FUNCTION SWITCH

Selects the desired program source.

LW **MW:**	AM reception
FM:	FM reception with automatic switching for stereo or mono broadcasts
PHONO:	For playing records
AUX:	For the component connected to the AUX input jacks.

■ TAPE SWITCH

For playback from tape deck, and monitoring programs being recorded.

SOURCE:	For tape recording of and listening to the program source selected by the function switch.
TAPE:	For playback from the tape deck connected to TAPE (PLAY) terminals on the rear panel.

While using a program source selected with the function switch, this switch should be kept in the SOURCE position.

■ FM MUTING/MODE SWITCH

Turn this switch ON (⊓) to suppress the interstation noise heard between stations while scanning the dial. However, because weak broadcasts will be suppressed along with the static by the muting circuit, it must be turned OFF (⊏) to receive weak stations. Selects either stereo or mono reception. This switch has no effect on AM reception.

■ LOUDNESS SWITCH

In the ON (⊏) position, low and high frequencies are enhanced to compensate for the frequency response of the human ear at low volume levels.

3. ANTENNA CONNECTIONS

▪ FM ANTENNA CONNECTION

The best FM broadcast reception is obtained when an outdoor FM antenna is connected to the receiver. However, the simple T-type indoor antenna provided as an accessory with the SA-2000L will provide satisfactory results in high signal strength areas (near an FM broadcast station or in an all wood house).

* Connect the antenna leads to the FM antenna terminals on the rear panel of the receiver (refer to Fig. 3).

* Move the antenna around until optimum reception is obtained (indicated by the signal strength indicator), then affix the antenna to the wall or ceiling in that position.

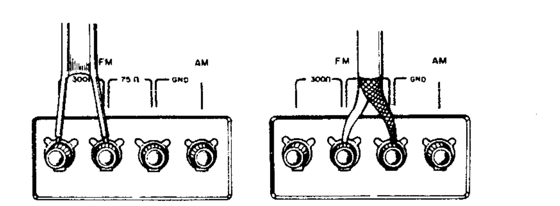


Figure 3.

▪ AM Antenna

Under almost all conditions, the built-in AM ferrite bar antenna will be more than sufficient for good AM reception. Turning the SA-2000L receiver around will help reception of more distant AM stations, but if desired, an outdoor AM antenna may also be set up.

4. CONNECING OTHER EQUIPMENT

▪ TURNTABLE CONNECTION

Connect the output cables from the turntable to the PHONO terminals of the receiver. If the turntable is equipped with a ground wire or terminal, be sure to connect it to the ground terminal (GND) of the receiver. If this simple task is overlooked, it may result in the generation of hum or howling noise.

▪ TAPE DECK CONNECTION (Fig. 4)

Your stereo receiver has output (TAPE) and playback jack for recording systems. When connecting a tape deck to the receiver, use the connection cord extending from the deck.

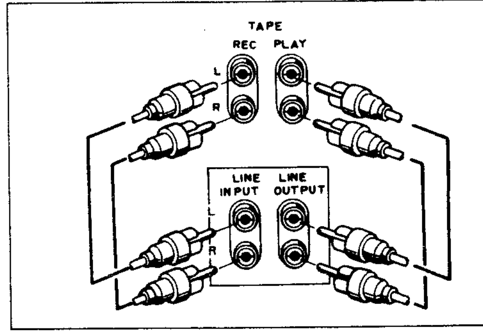


Figure 4.

▪ CONNECTIONS FOR RECORDING AND PLAYBACK

Connect the tape deck input terminals (LINE IN) to the receiver's record terminals (REC), and the deck output terminals (LINE OUT) to the receiver's playback (PLAY) terminals.

▪ AUX INPUT JACK

This terminal provides for an auxiliary input from another source such as a TV or cartridge tape player.

▪ CONNECTING THE SPEAKER SYSTEMS (Fig. 5)

Connection of speaker cables to the rear panel of the receiver requires considerable care. Connect the right hand speaker to the R output terminals, and the left hand speaker to the L output terminals, making sure, however, that plus (+) terminals are connected to plus, and minus (−) to minus. All connections must be neat without any bare wires making contact (short-circuit) with other wires or terminals.

Before starting to connect the speakers, turn the receiver power switch OFF. Recheck that there is no short circuiting between (+) and (−) terminals of the speakers. Even a temporary short will operate the receiver's protective circuit, and no sound will be heard.

Correct (+) to (+) and (−) to (−) connections are required to ensure stereo sound reproduction.

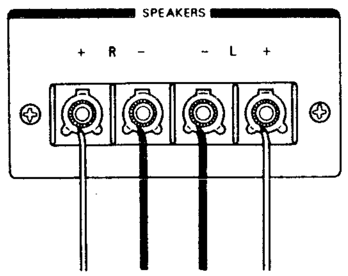


Figure 5.

5. OPERATING THE RECEIVER

▪ BEFORE SWITCHING POWER ON

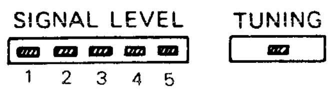
It is vital that controls and switches are set as specified as follows before turning on the power switch in order to avoid spontaneous overload of the speaker system and other receiver components.

1. The volume control is set to MIN (turn counterclockwise).
2. The bass, treble and balance controls are set approximately at the center.
3. The tape switch is set to SOURCE.
4. The FM muting/mode switch is ON (⎍).

Note: The interval after the switch is turned to "on" until the sound is heard.
This set does not produce the sound of the program source in about 3 ~ 6 seconds after the power is turned to "on". If the FUNCTION switch or the VOLUME is turned immediately after the sound is heard, loud noises may be produced, but it is not because of a fault. Turn these after a few seconds.

▪ FM BROADCAST RECEPTION

1. Set the function switch to the FM position.
2. Move the FM muting/mode switch to the ON (⎍) position.
3. Tune in FM broadcasts roughly by watching the SIGNAL INDICATOR, then tune in precisely by slowly rotating the tuning knob until only the green lamp of the TUNING INDICATOR comes on.
4. Adjust the volume, bass, treble and balance controls, as well as the loudness control switch and the filters, to obtain the desired volume and tone quality.



Optimum tuning (green LED is lit)

Note: The tuning indicator will not come on when the strength of the signal received is below the muting threshold level.

▪ AM BROADCAST RECEPTION

1. Set the function switch to the AM position.
2. Rotate the tuning knob until the tuning pointer is aligned with the frequency of the desired station. Fine tune until the maximum number of signal strength indicator LEDs is lit.

Note: The tuning indicator, stereo indicator, do not operate during AM reception.

▪ PLAYING RECORDS

1. Set the function switch to the PHONO position.
2. Operate the record player.
3. Adjust the volume, bass, treble and balance controls, as well as the loudness control switch and the filters, to obtain the desired volume and tone quality.

▪ PLAYING COMPONENTS CONNECTED TO THE AUX JACKS

When a cartridge deck or other component is connected to the AUX terminals on the rear panel, follow the procedure given below:

1. Set the function switch to the AUX position.
2. Operate the component connected to the AUX terminals.
3. Adjust the volume, balance, treble and bass controls, and the loudness and filter switches, to obtain the desired volume and tone quality.

▪ TAPE DECK OPERATIONS

• Playback

1. Connect the line output(s) of the tape deck(s) to the TAPE PLAY jacks and move the tape mode switch to the TAPE position.
2. Prepare the tape deck for playback.
3. Adjust the volume, bass, treble and balance controls, as well as the loudness switch according to your taste.

Note:
1. When the tape mode switch is set to the TAPE position, a tape can be played back regardless of the setting of the function switch.
2. Always keep the tape mode switch in the SOURCE position, except when playing back a tape.

- **Recording**

Connect the line input of the tape deck to TAPE REC of the receiver, and move the tape mode switch to SOURCE. Select the program source to be recorded on the tape deck by setting the receiver function switch as desired. The output of the receiver to the TAPE REC terminals is maintained at a constant level, regardless of the position of the volume control. The tape deck should therefore be adjusted to the desired recording level and fidelity.

1. Set the function switch to the desired program source.
2. Start playing the program to be recorded.
3. Start the tape deck recording mode, checking that the proper recording level is maintained.
4. During recording, it is not necessary to adjust the volume, tone and balance controls of the receiver as they have no effect on the recording.

- **TAPE MONITORING**

When recording with a tape deck connected to the TAPE terminals, if the tape deck is equipped with a monitoring mechanism, monitoring of the recording is possible by moving the tape mode switch from the SOURCE position to the TAPE position.

6. DISASSEMBLY INSTRUCTIONS

TOP COVER REMOVAL

1. Remove 4 screws ① (3ϕ x 8mm) securing the both sides of the set.

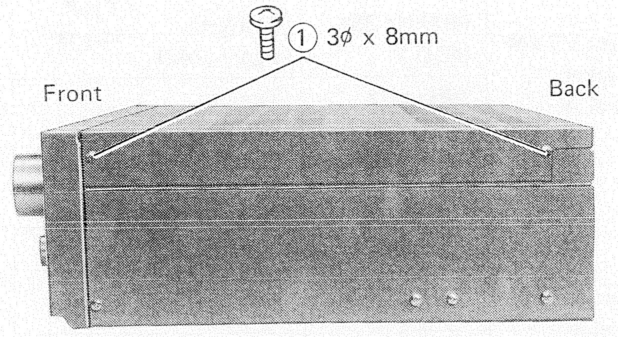


Figure 6.

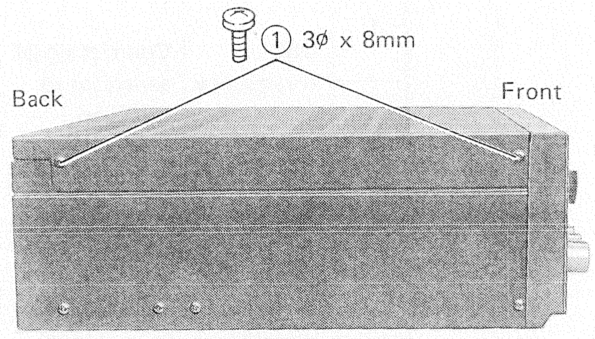


Figure 7.

FRONT PANEL REMOVAL

1. Remove 5 Knobs ②. (Fig. 8)
2. Detach the top cover. (Fig. 6, 7)
3. Remove 3 screws ③ (3ϕ x 8mm) securing the panel at the top. (Fig. 9)
4. Remove 2 screws ④ (3ϕ x 10mm) securing the panel at the bottom. (Fig. 10)

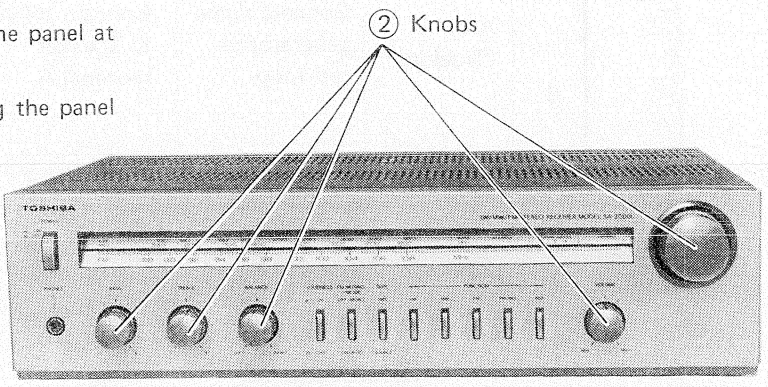


Figure 8.

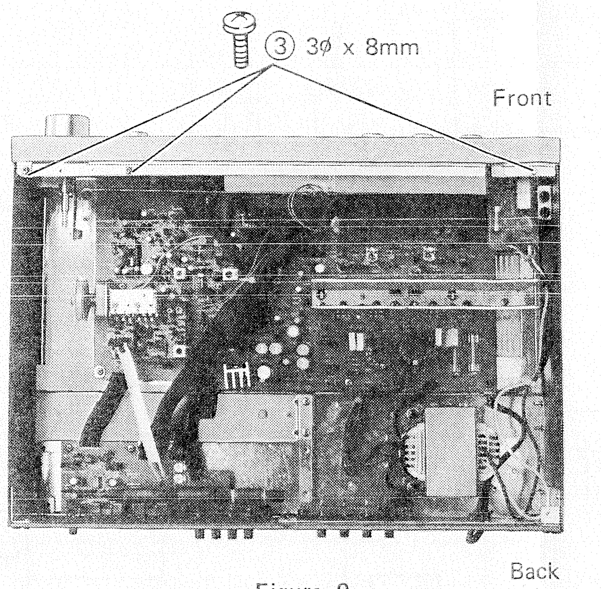


Figure 9.

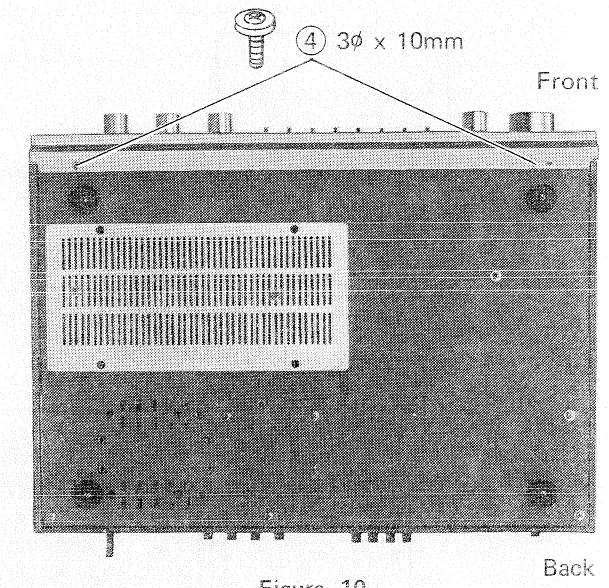
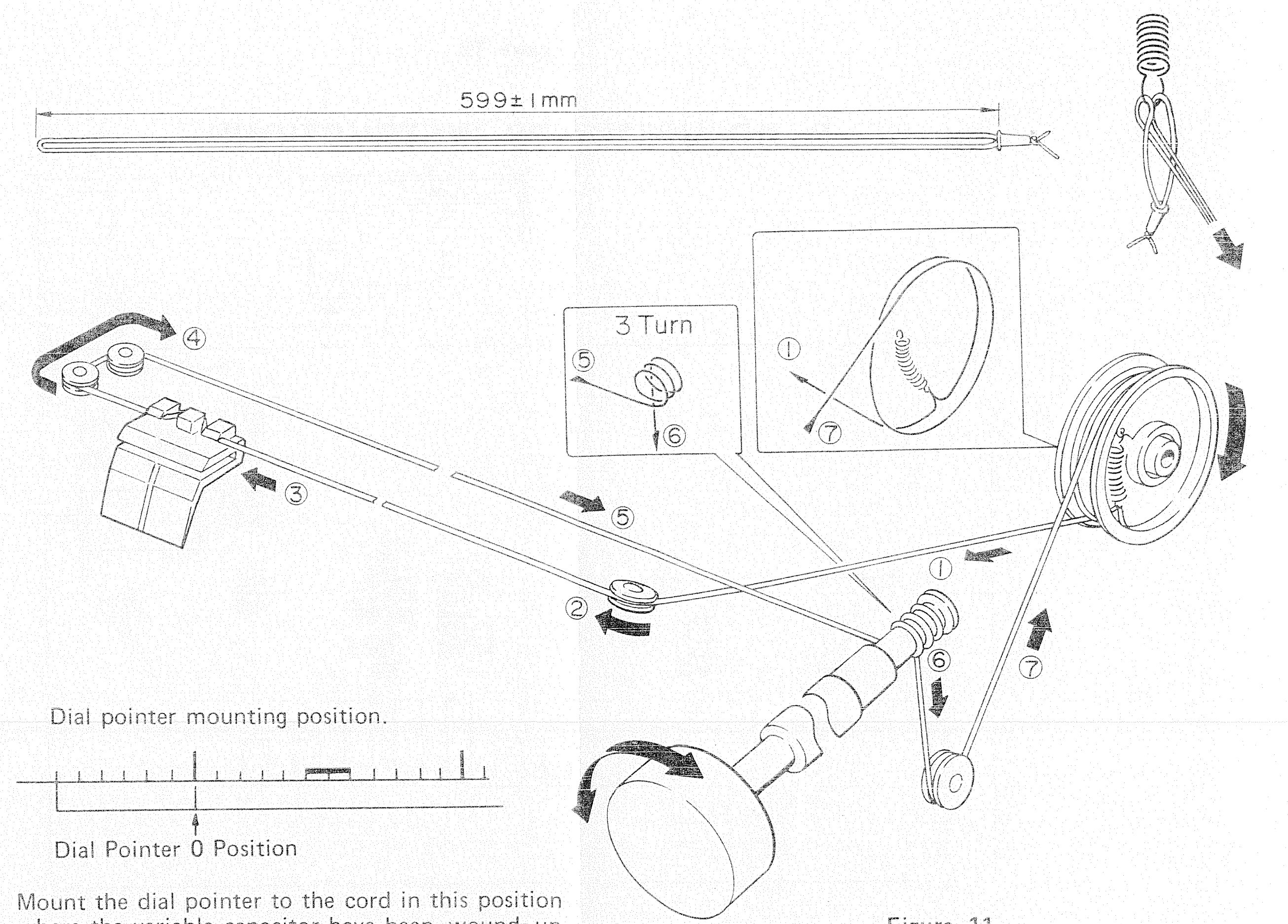


Figure 10.

7. DIAL CORD RESTRINGING

1. Set the variable capacitor to the maximum capacitance (fully counterclockwise position).
2. Mount a spring to the drum and wind the dial cord in the numerical sequence as shown in the direction of arrows.



Mount the dial pointer to the cord in this position where the variable capacitor have been wound-up fully clockwise.

Figure 11.

8. BLOCK DIAGRAM

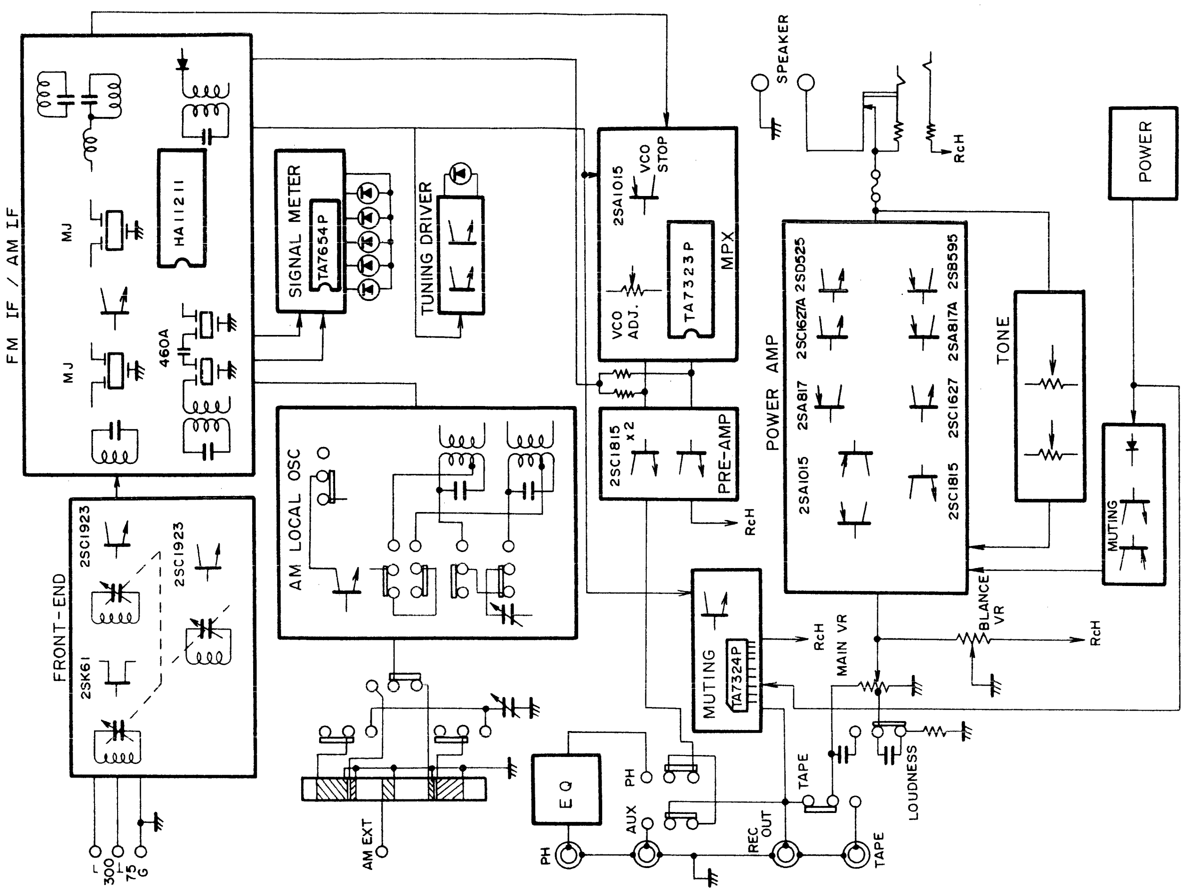

FM IF / AM IF
MJ
MJ
460A
HA1121I
SIGNAL METER
TA7654P
TUNING DRIVER
2SA1015
VCO STOP
TA7323P
MPX
VCO ADJ.
2SC1815 x2
PRE-AMP
POWER AMP
2SA817
2SC1627A
2SD525
2SA1015
2SC1815
2SB595
2SA817A
2SC1627
2SC1815
TONE
POWER
SPEAKER
RcH
MUTING
AM LOCAL OSC
FRONT-END
2SC1923
2SC1923
2SK61
MUTING
TA7324P
E Q
PH
AUX
REC OUT
TAPE
MAIN VR
BLANCE VR
LOUDNESS
AM EXT
300Ω
75Ω
G

Figure 12.

9. ADJUSTMENTS INSTRUCTIONS

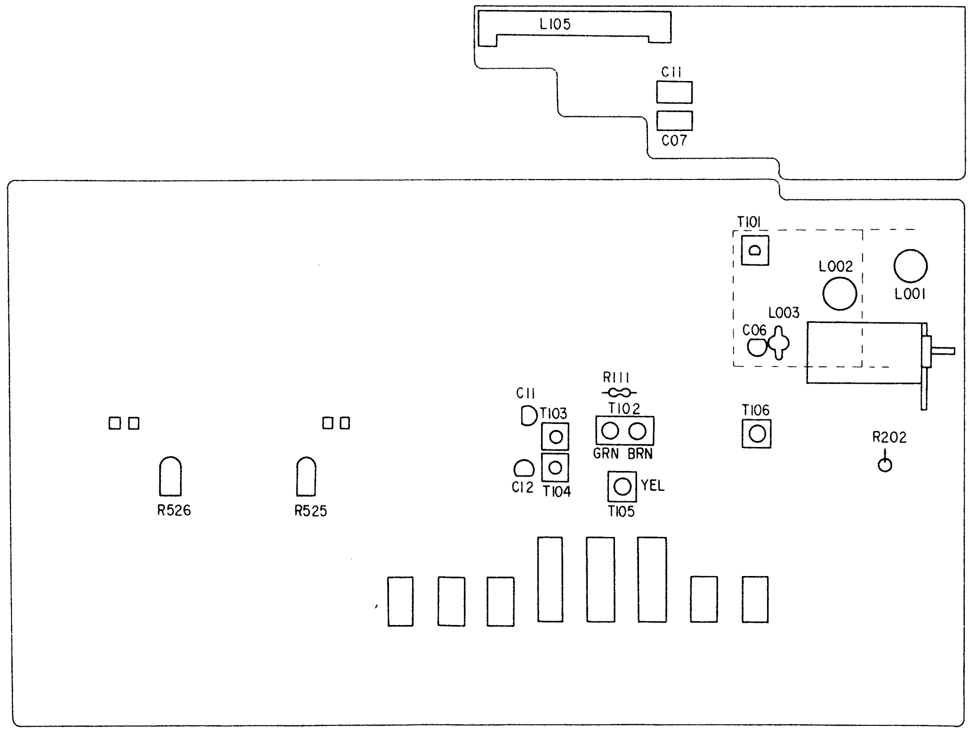

L105
C11
C07
T101
L002
L001
L003
C06
R111
T102
C11
T103
C12
T104
GRN BRN
YEL
T105
T106
R202
R526
R525

Figure 13. Top View

AM ADJUSTMENT

Test equipments/Tools required

1. Signal generator
2. Sweep generator
3. Test loop antenna
4. VTVM
5. Adjusting screwdriver
6. Adjusting screwdriver (Use to antenna core)
7. Oscilloscope

IF ADJUSTMENT

Step	Adjustment	Remarks
IF Response	T103	Adjust for scope pattern with specified marker (460 kHz) as illustrated in Figure 14.

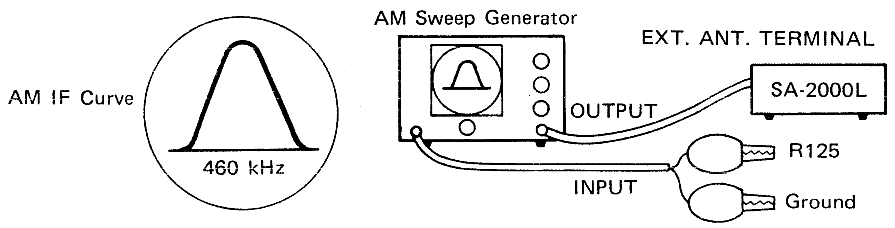

AM IF Curve
460 kHz
AM Sweep Generator
EXT. ANT. TERMINAL
OUTPUT
SA-2000L
R125
INPUT
Ground

Figure 14.

FREQUENCY COVERAGE AND TRACKING ADJUSTMENT (LW)

Step	Adjusting Circuit	Connection Input	Connection Output	SG Frequency	Position of Tuning Dial	Adjust-ment	VTVM
1	OSC (Frequency Coverage)	Connect signal generator to test loop.	Connect VTVM to Speaker terminal A.	515 kHz (142) (400 Hz 30% MOD.)	Tune to 515 kHz signal (142)	T103 (T104)	Maximum
2				1650 kHz (365)(400 Hz 30% MOD.)	Tune to 1650 kHz signal (365)	C11 (C12)	
Repeat steps 1 and 2.							
3	OSC (Frequency Coverage)	Connect signal generator to test loop.	Connect VTVM to Speaker terminal A.	600 kHz (400 Hz 30% MOD.)(160)	Tune to 600 kHz signal (160)		Adjust for no scale error.
4				1400 kHz (400 Hz 30% MOD.)(360)	Tune to 1400 kHz signal (360)		
Repeat steps 3 and 4. If any error is present, repeat steps from 1 to 4.							
5	ANT (Tracking)	Connect signal generator to test loop.	Connect VTVM to Speaker terminal A.	600 kHz (400 Hz 30% MOD.)(160)	Tune to 600 kHz signal (160)	Ferrite Ant. Coil L105	Maximum
6				1400 kHz (400 Hz 30% MOD.)(360)	Tune to 1400 kHz signal (360)	C07 (C10)	
Repeat step 5 and 6.							

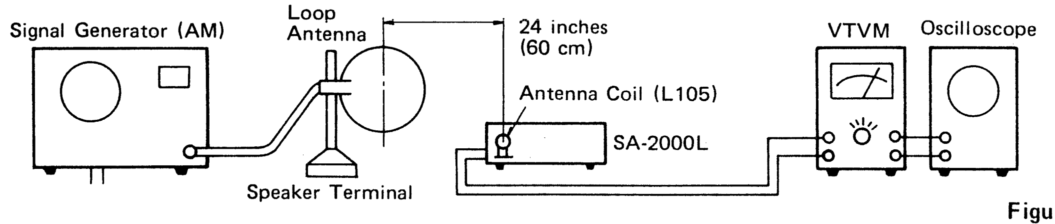

Signal Generator (AM)
Loop Antenna
24 inches (60 cm)
Antenna Coil (L105)
SA-2000L
VTVM
Oscilloscope
Speaker Terminal

Figure 15.

FM ADJUSTMENT

Test equipments/Tools required

1. Distortion meter
2. Signal generator
3. Oscilloscope
4. VTVM
5. FM dummy antenna (300 ohms)
6. Dummy load resistor
7. Network
8. Adjusting screwdriver
9. Adjusting bar
10. Tuning meter

Step	Adjusting Circuit	Connection		SG Frequency	Position of Tuning Dial	Adjust-ment	VTVM
		Input	Output				
1	IF distortion Adjustment (MONO)		Connect Tuning Meter to R116.		No signal	T102 (BRN Color)	Adjust tuning meter pointer so as to keep center.
2	OSC (Frequency coverage)	Connect FM signal generator to FM antenna terminal.	Connect VTVM to speaker terminal.	87.3 MHz	87.5 Tune to 87.3 MHz signal	L003	Maximum
3				109.0 MHz	Tune to 108.5 MHz signal	C06	
Repeat steps 1, 2 and 3.							
4	RF (Tracking)	Connect FM signal generator to FM antenna terminal.	Connect VTVM to speaker terminal.	88 MHz	Tune to 88 MHz signal	L001 L002	Maximum
5				108 MHz	Tune to 108 MHz signal	C02 C04	
Repeat steps 4 and 5.							
6	IF Distortion Adjustment (MONO)	Connect FM signal generator to FM antenna terminal. Connect the modulator to signal generator.	Connect VTVM, oscilloscope and distortion meter to speaker terminal. Connect Tuning Meter to TP-1, 2.	SG 98 MHz	Tune to 98 MHz signal	T102 (GRN Color)	Distortion Minimum
7	IF Distortion Adjustment (MONO)					T102 (BRN Color)	Adjust tuning meter pointer so as to keep center.
Repeat steps 6 and 7.							
8	Distortion Adjustment (Stereo)	Connect FM signal generator to FM antenna terminal. Connect the modulator to signal generator.	Connect VTVM, oscilloscope and distortion meter to speaker terminal.	SG 98 MHz	Tune to 98 MHz signal	T101	Distortion Minimum

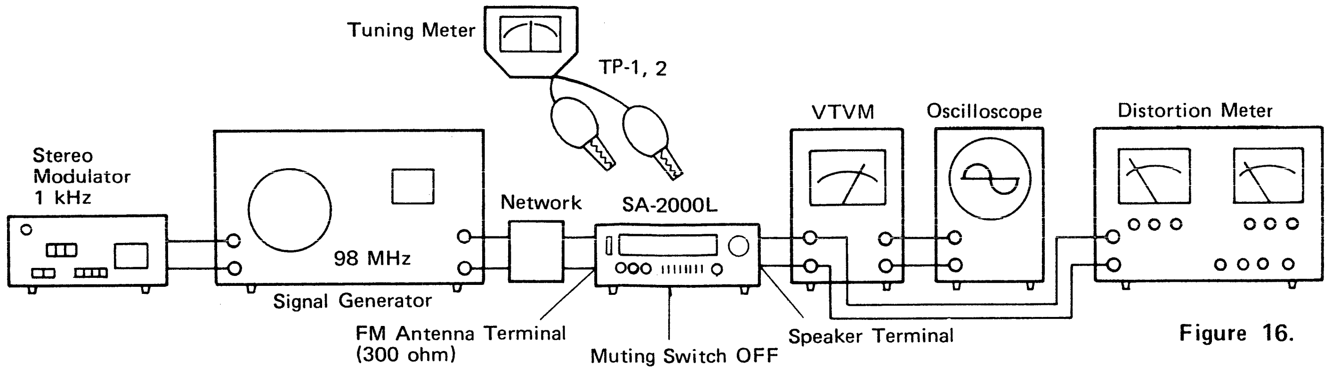

Tuning Meter
TP-1, 2
Stereo Modulator 1 kHz
98 MHz
Signal Generator
Network
SA-2000L
VTVM
Oscilloscope
Distortion Meter
FM Antenna Terminal (300 ohm)
Muting Switch OFF
Speaker Terminal

Figure 16.

FM MPX ADJUSTMENT

Test Equipments/Tools required

1. Frequency counter
2. Signal generator
3. Stereo modulator
4. VTVM
5. 300 ohm FM dummy antenna
6. Oscilloscope

Pilot signal adjustment	Connect a frequency counter to the R202 with 100K ohm Resistor, and adjust the R203 for 19 kHz reading counter with no-signal input.

SIGNAL METER ADJUSTMENT (FM)

Connection	Signal Generator	Adjustment
Connect signal generator to FM antenna terminal. See Figure 17.	Frequency: 98 MHz SG output: 60 dB	Adjust the R111 so that the signal meter indicates 5.0.

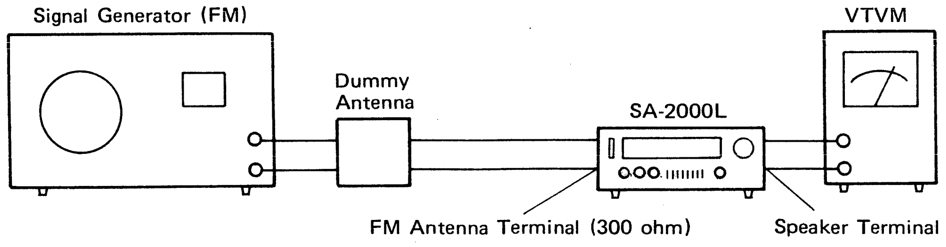

Signal Generator (FM)
Dummy Antenna
SA-2000L
VTVM
FM Antenna Terminal (300 ohm)
Speaker Terminal

Figure 17.

IDLE ADJUSTMENT

Check emitter terminal of each transistor with resistors R525, R526, R533 or R535 and set to 7mV ± 2mV after six minutes from POWER-ON.

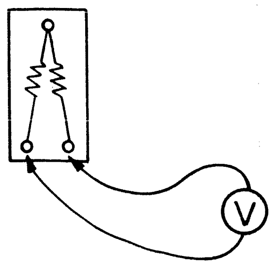


Figure 18.

CAUTION:

When realigning the FM Receiving Frequency, the lowest side of the frequency range must not be below 87.5 MHz in order to comply with FTZ regulations in West Germany.

10. P.C. BOARD PARTS LOCATIONS

Q301

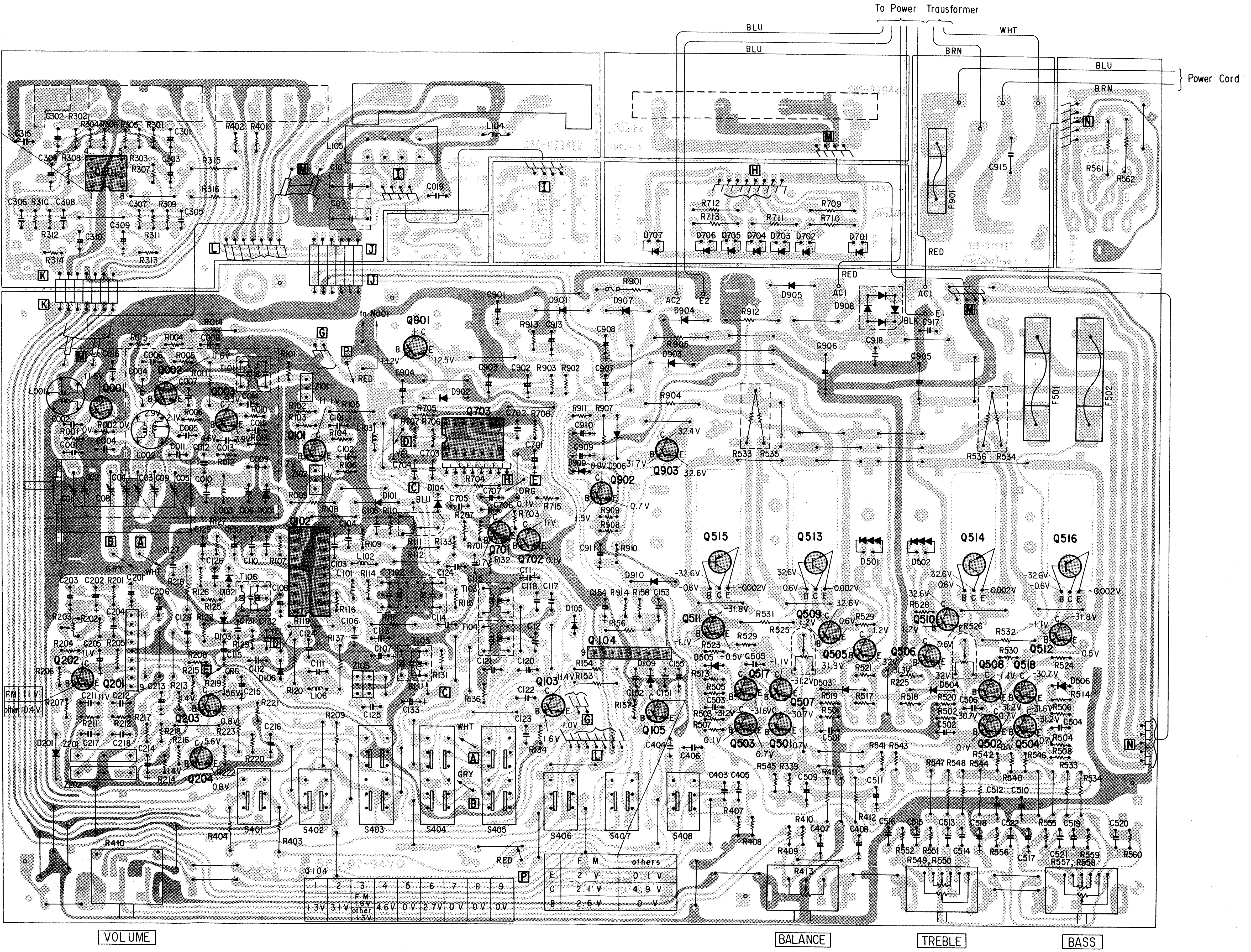
1	0 V
2	0 V
3	0 V
4	-15 V
5	0 V
6	0 V
7	0 V
8	15 V

Q102

	AM / FM
1	3.2V / 3.8V
2	0.1 V
3	3.4V / 2.1V
4	0.8 V
5	0 V
6	0 V
7	3 V / 2.1V
8	0.1 V
9	0 V
10	5.2V / 5 V
11	0 V / 12.7V
12	5.8 V
13	5.8 V
14	0.1 V
15	7.1V / 6.5V
16	6.6 V
17	0 V
18	0 V

Q703

1	0 V
2	—
3	—
4	1.3V
5	1.3V
6	0V
7	0V
8	12.6V
9	11.1V
10	11.1V
11	11.1V
12	11.1V
13	11.1V
14	0.2V


To Power Trausformer
Power Cord
BLU
BLU
BRN
WHT
BLU
BRN
RED
RED
RED
BLK
YEL
ORG
GRY
WHT
FM 11V
other 10.4V
Q301
Q102
Q703
Q901
Q902
Q903
Q515
Q513
Q514
Q516
F901
F501
F502
S401
S402
S403
S404
S405
S406
S407
S408
R410
R413
VOLUME
BALANCE
TREBLE
BASS

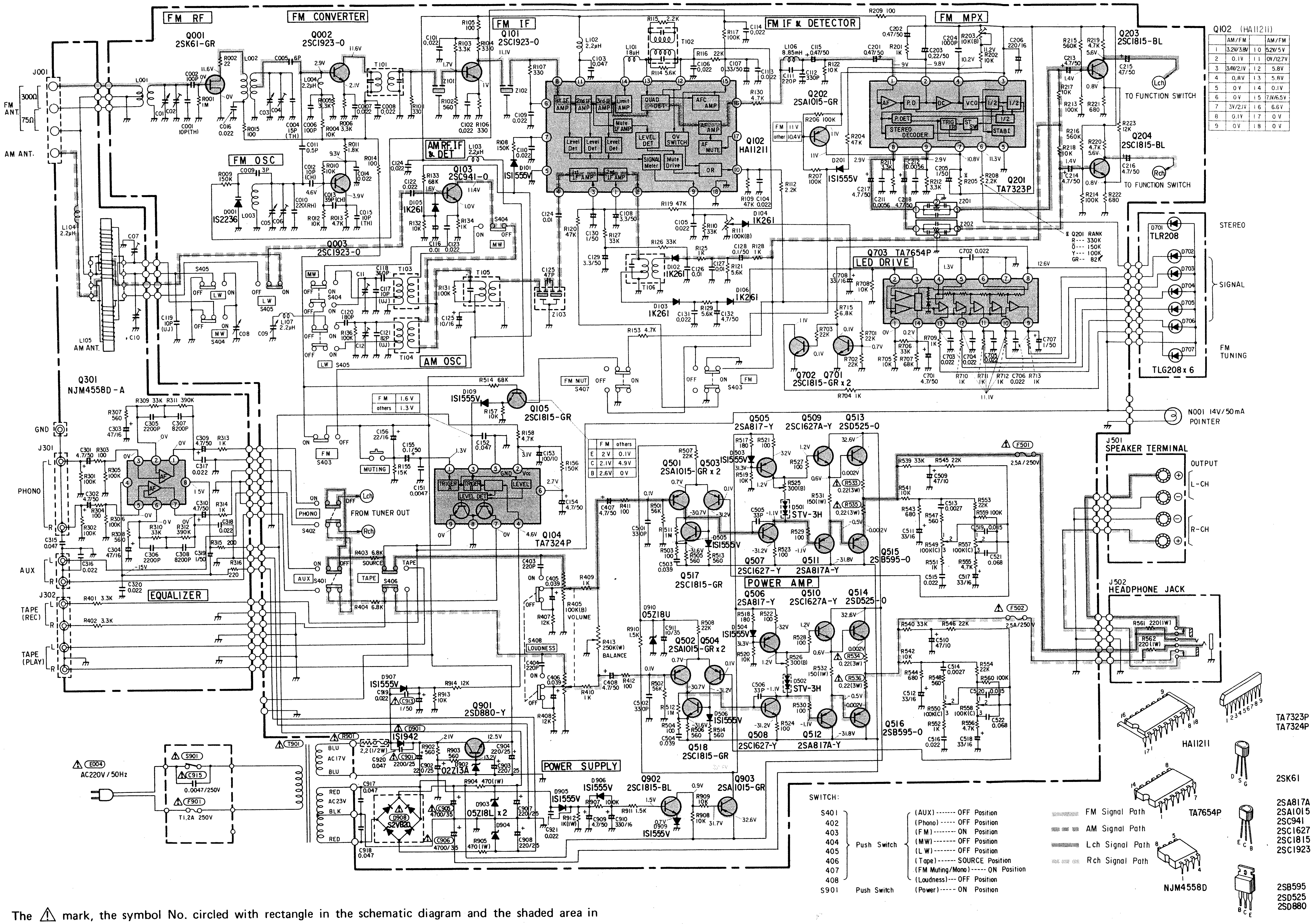
Q104

1	2	3	4	5	6	7	8	9
1.3V	3.1V	FM 1.6V other 1.3V	4.6V	0V	2.7V	0V	0V	0V

	FM	others
E	2 V	0.1 V
C	2.1 V	4.9 V
B	2.6 V	0 V

Figure 19.

11. SCHEMATIC DIAGRAM


FM RF
Q001 2SK61-GR
FM CONVERTER
Q002 2SC1923-O
FM IF
Q101 2SC1923-O
FM IF & DETECTOR
FM MPX
Q203 2SC1815-BL
Q204 2SC1815-BL
Q201 TA7323P
Q202 2SA1015-GR
Q102 HA11211
FM OSC
AM RF, IF & DET
Q103 2SC941-O
Q003 2SC1923-O
AM OSC
J001
FM ANT. 300Ω 75Ω
AM ANT.
L105 AM ANT.
Q703 TA7654P
LED DRIVE
Q702 Q701 2SC1815-GR x 2
D701 TLR208
STEREO
SIGNAL
FM TUNING
TLG208 x 6
TO FUNCTION SWITCH
Q301 NJM4558D-A
GND
J301
PHONO
AUX
J302
TAPE (REC)
TAPE (PLAY)
EQUALIZER
Q105 2SC1815-GR
Q104 TA7324P
FROM TUNER OUT
MUTING
N001 14V/50mA POINTER
J501 SPEAKER TERMINAL
OUTPUT
L-CH
R-CH
J502 HEADPHONE JACK
Q505 2SA817-Y
Q509 2SC1627A-Y
Q513 2SD525-O
Q501 Q503 2SA1015-GR x 2
Q507 2SC1627-Y
Q511 2SA817A-Y
Q515 2SB595-O
Q517 2SC1815-GR
POWER AMP
Q506 2SA817-Y
Q510 2SC1627A-Y
Q514 2SD525-O
Q502 Q504 2SA1015-GR x 2
Q508 2SC1627-Y
Q512 2SA817A-Y
Q516 2SB595-O
Q518 2SC1815-GR
D501 STV-3H
D502 STV-3H
VOLUME
BALANCE
LOUDNESS
Q901 2SD880-Y
POWER SUPPLY
Q902 2SC1815-BL
Q903 2SA1015-GR
AC220V / 50Hz
T1.2A 250V
TA7323P
TA7324P
HA11211
2SK61
TA7654P
NJM4558D
2SA817A
2SA1015
2SC941
2SC1627
2SC1815
2SC1923
2SB595
2SD525
2SD880
FM Signal Path
AM Signal Path
Lch Signal Path
Rch Signal Path

Q102 (HA11211)

	AM/FM		AM/FM
1	3.2V/3.8V	10	5.2V/5V
2	0.1V	11	0V/12.7V
3	3.4V/2.1V	12	5.8V
4	0.8V	13	5.8V
5	0V	14	0.1V
6	0V	15	7.1V/6.5V
7	3V/2.1V	16	6.6V
8	0.1V	17	0V
9	0V	18	0V

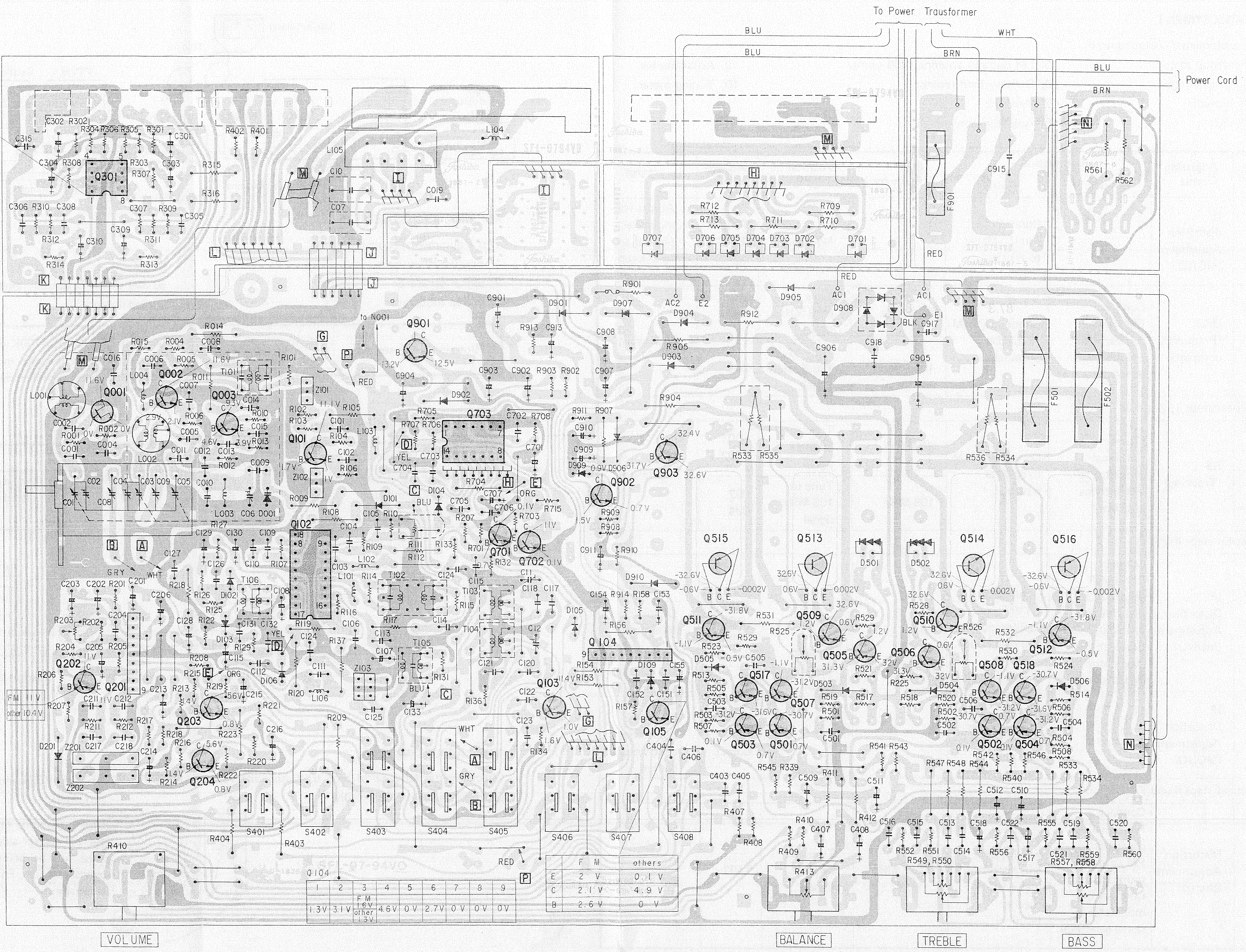
SWITCH:

S401	Push Switch	(AUX) ------- OFF Position
402		(Phono) ----- OFF Position
403		(FM) -------- ON Position
404		(MW) ------- OFF Position
405		(LW) ------- OFF Position
406		(Tape) ------ SOURCE Position
407		(FM Muting/Mono) ----- ON Position
408		(Loudness) --- OFF Position
S901	Push Switch	(Power) ----- ON Position

CAUTION: The ⚠ mark, the symbol No. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list.

Figure 20.

10. P.C. BOARD PARTS LOCATIONS


To Power Trausformer
Power Cord
BLU
WHT
BRN
RED
BLK
ORG
GRY
YEL
Q301
Q001
Q002
Q003
Q101
Q102
Q103
Q104
Q105
Q201
Q202
Q203
Q204
Q501
Q502
Q503
Q504
Q505
Q506
Q507
Q508
Q509
Q510
Q511
Q512
Q513
Q514
Q515
Q516
Q517
Q518
Q701
Q702
Q703
Q901
Q902
Q903
F501
F502
F901
S401
S402
S403
S404
S405
S406
S407
S408
R410
R413
R549, R550
R557, R558
FM 11V
other 10.4V
VOLUME
BALANCE
TREBLE
BASS

Q301

1	0 V
2	0 V
3	0 V
4	-15 V
5	0 V
6	0 V
7	0 V
8	15 V

Q102

	AM / FM
1	3.2V / 3.8V
2	0.1 V
3	3.4V / 2.1V
4	0.8 V
5	0 V
6	0 V
7	3 V / 2.1V
8	0.1 V
9	0 V
10	5.2V / 5 V
11	0 V / 12.7V
12	5.8 V
13	5.8 V
14	0.1 V
15	7.1V / 6.5V
16	6.6 V
17	0 V
18	0 V

Q703

1	0 V
2	—
3	—
4	1.3V
5	1.3V
6	0 V
7	0 V
8	12.6V
9	11.1V
10	11.1V
11	11.1V
12	11.1V
13	11.1V
14	0.2V

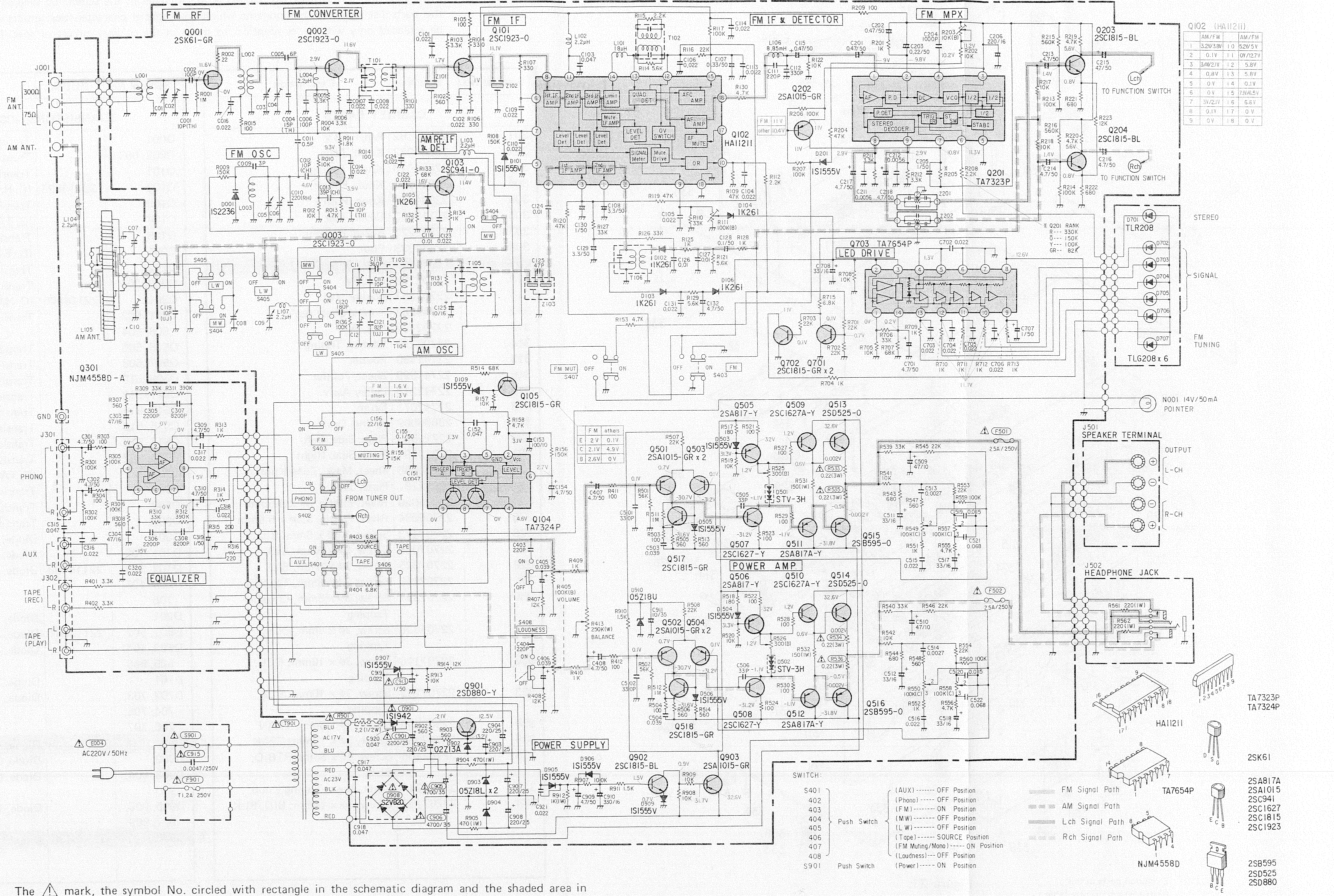
Q104

1	2	3	4	5	6	7	8	9
1.3V	3.1V	FM 1.6V other 1.3V	4.6V	0V	2.7V	0V	0V	0V

	FM	others
E	2 V	0.1 V
C	2.1 V	4.9 V
B	2.6 V	0 V

Figure 19.

11. SCHEMATIC DIAGRAM


FM RF
Q001 2SK61-GR
FM CONVERTER
Q002 2SC1923-O
FM IF
Q101 2SC1923-O
FM IF & DETECTOR
Q102 HA11211
FM MPX
Q201 TA7323P
Q202 2SA1015-GR
Q203 2SC1815-BL
Q204 2SC1815-BL
TO FUNCTION SWITCH
FM OSC
AM RF, IF & DET
Q103 2SC941-O
Q003 2SC1923-O
AM OSC
FM ANT. 300Ω 75Ω
AM ANT.
J001
LED DRIVE
Q703 TA7654P
Q702 Q701 2SC1815-GR x 2
D701 TLR208
TLG208 x 6
STEREO
SIGNAL
FM TUNING
N001 14V/50mA POINTER
Q301 NJM4558D-A
EQUALIZER
GND
J301 PHONO
AUX
J302 TAPE (REC)
TAPE (PLAY)
Q105 2SC1815-GR
Q104 TA7324P
MUTING
FROM TUNER OUT
FM MUT S407
VOLUME
BALANCE
LOUDNESS
POWER AMP
Q501 Q503 2SA1015-GR x 2
Q502 Q504 2SA1015-GR x 2
Q505 2SA817-Y
Q506 2SA817-Y
Q507 2SC1627-Y
Q508 2SC1627-Y
Q509 2SC1627A-Y
Q510 2SC1627A-Y
Q511 2SA817A-Y
Q512 2SA817A-Y
Q513 2SD525-O
Q514 2SD525-O
Q515 2SB595-O
Q516 2SB595-O
Q517 2SC1815-GR
Q518 2SC1815-GR
J501 SPEAKER TERMINAL
OUTPUT L-CH R-CH
J502 HEADPHONE JACK
POWER SUPPLY
Q901 2SD880-Y
Q902 2SC1815-BL
Q903 2SA1015-GR
AC220V/50Hz
T1.2A 250V
F501 2.5A/250V
F502 2.5A/250V
HA11211
TA7323P TA7324P
TA7654P
NJM4558D
2SK61
D S G
2SA817A 2SA1015 2SC941 2SC1627 2SC1815 2SC1923
E C B
2SB595 2SD525 2SD880
B C E

Q102 (HA11211)

	AM/FM		AM/FM
1	3.2V/3.8V	10	5.2V/5V
2	0.1V	11	0V/12.7V
3	3.4V/2.1V	12	5.8V
4	0.8V	13	5.8V
5	0V	14	0.1V
6	0V	15	7.1V/6.5V
7	3V/2.1V	16	6.6V
8	0.1V	17	0V
9	0V	18	0V

SWITCH:

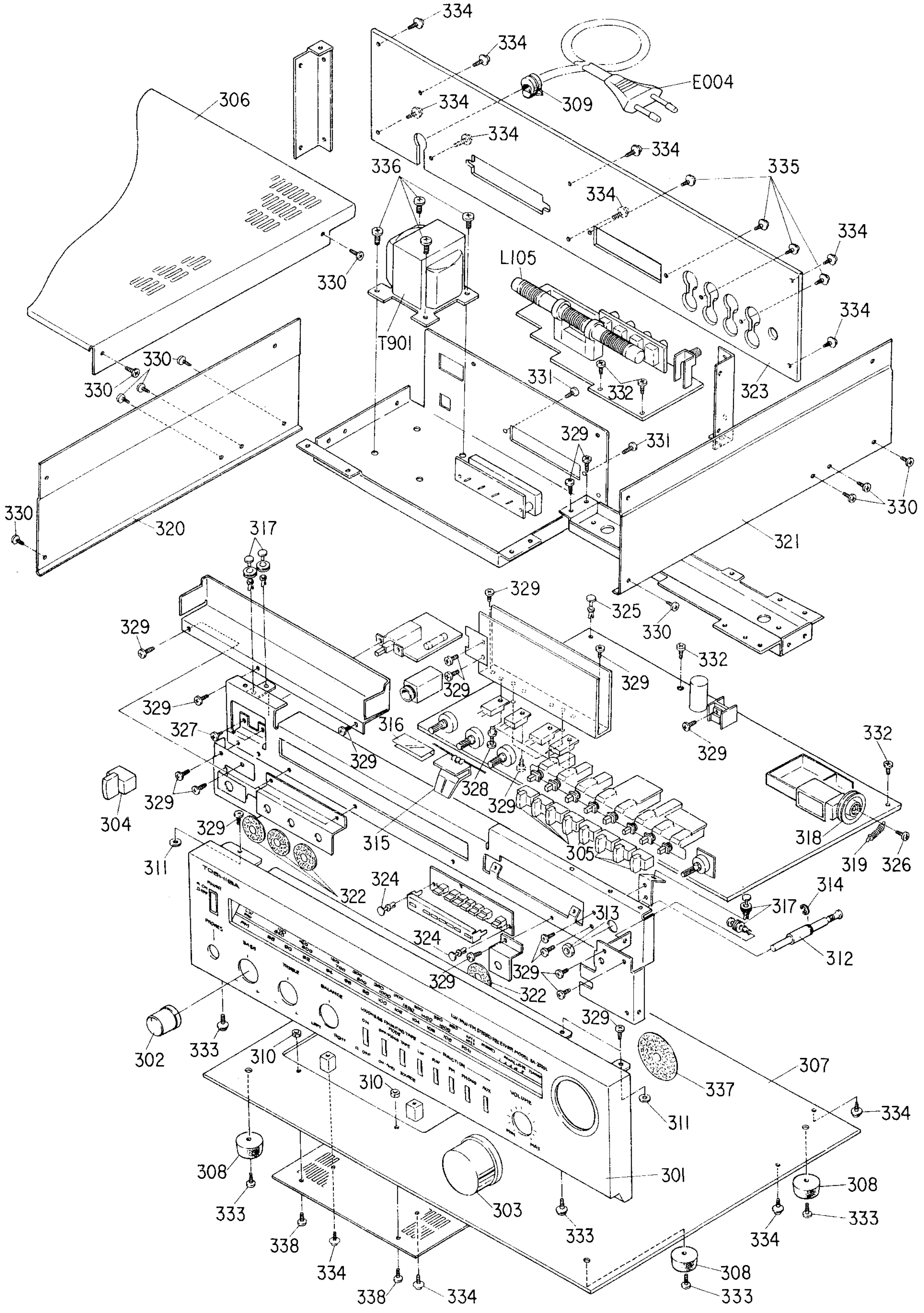
Switch	Type	Function	Position
S401	Push Switch	(AUX)	OFF Position
402	Push Switch	(Phono)	OFF Position
403	Push Switch	(FM)	ON Position
404	Push Switch	(MW)	OFF Position
405	Push Switch	(LW)	OFF Position
406	Push Switch	(Tape)	SOURCE Position
407	Push Switch	(FM Muting/Mono)	ON Position
408	Push Switch	(Loudness)	OFF Position
S901	Push Switch	(Power)	ON Position

▨ FM Signal Path
▨ AM Signal Path
▨ Lch Signal Path
▨ Rch Signal Path

CAUTION: The ⚠ mark, the symbol No. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list.

Figure 20.

12. CABINET PARTS LOCATIONS


334
334
306
334
309
E004
334
334
336
335
334
L105
330
334
T901
334
330
330
331
332
323
329
331
330
330
320
317
321
329
325
329
330
332
329
329
327
316
329
332
329
328
329
304
329
318
311
315
305
319
326
324
322
314
317
313
312
324
329
322
329
302
333
310
307
337
310
311
308
301
308
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303
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338
334
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334
308
338
334
333

NOTE: Excluded parts in the Parts List are not available as replacement parts.

Figure 21.

13. PARTS LIST

CAUTION: The ⚠ mark, the symbol No. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list.

Symbol No.	Part No.	Description
CABINET PARTS		
301	20017162	Panel Ass'y
302	22884083	Knob, Tone
303	22884016	Knob, Tuning
304	22824350	Knob, Power
305	22884013	Knob, Push
306	22712582	Cover, Top
307	22852229	Board, Bottom
308	22874033	Foot
⚠ 309	22845528	Bush, Power Cord
310	22702108	Nut, 3ϕ
311	22703253	Washer, 4ϕ
312	22749287	Tuning Shaft Ass'y
313	22702107	Nut, 9ϕ
314	22703175	Washer, Tuning
315	22741350	Pointer
316	22741329	Sheet, Pointer
317	22742218	Pulley Ass'y
318	22742071	Drum
319	20866009	Spring, Drum
320	22712583	Plate, Side, Left
321	22712591	Plate, Side, Right
322	22758058	Sheet, Mask, Tone Knob
323	22852231	Plate, Jack
324	22705020	Rivet, Plastic, 3ϕ x 4.5mm
325	22705034	Rivet, Plastic, 3.5ϕ x 5.5mm
326	22707473	Screw, 2.6ϕ x 6mm, BID
327	22707066	Screw, 3ϕ x 6mm, BID
328	22701325	Screw, 3ϕ x 8mm, BID
329	22707115	Screw, 3ϕ x 8mm, Tapping
330	22707327	Screw, 3ϕ x 8mm, Chrome, Tapping
331	22701326	Screw, 3ϕ x 8mm, BLK, Tapping
332	22707116	Screw, 3ϕ x 10mm, RED, Tapping
333	22707282	Screw, 3ϕ x 10mm, BLK, Tapping
334	22707590	Screw, 3ϕ x 8mm, TPAN
335	22707380	Screw, 3ϕ x 10mm, TPAN
336	22707185	Screw, 4ϕ x 8mm, FTBID, BLK
337	22758243	Sheet, Mask, Tuning Knob
338	22707163	Screw, 3ϕ x 10mm, BID, BLK

Symbol No.	Part No.	Description
TRANSISTORS, ICS & DIODES		
Q001		Transistor, 2SK61-GR
Q002, 003		Transistor, 2SC1923-O
Q101		Transistor, 2SC1923-O
Q102	22114626	IC, HA11211
Q103		Transistor, 2SC941-O
Q104		IC, TA7324P
Q105		Transistor, 2SC1815-GR
Q201		IC, TA7323P
Q202		Transistor, 2SA1015-GR
Q203, 204		Transistor, 2SC1815-BL
Q301	22114470	IC, NJM4558D-A
Q501, 502, 503, 504		Transistor, 2SA1015-GR
Q505, 506		Transistor, 2SA817-Y
Q507, 508		Transistor, 2SC1627-Y
Q509, 510		Transistor, 2SC1627A-Y
Q511, 512		Transistor, 2SA817A-Y
Q513, 514		Transistor, 2SD525-O
Q515, 516		Transistor, 2SB595-O
Q517, 518		Transistor, 2SC1815-GR
Q701, 702		Transistor, 2SC1815-GR
Q703		IC, TA7654P
Q901		Transistor, 2SD880-Y
Q902		Transistor, 2SC1815-BL
Q903		Transistor, 2SA1015-GR
D001		Diode, 1S2236
D101, 109		Diode, 1S1555V
D102, 103, 104, 105, 106	22115498	Diode, 1K261UF
D201		Diode, 1S1555V
D501, 502	22115481	Diode, STV-3H
D503, 504, 505, 506		Diode, 1S1555V
D701		Diode, TLR208, LED
D702, 703, 704, 705, 706, 707		Diode, TLG208, LED
⚠ D901		Diode, 1S1942
D902		Diode, 02Z13A
D903, 904, 910		Diode, 05Z18-L
D905, 906, 907, 909		Diode, 1S1555V
⚠ D908	22115438	Diode, S2VB20

Symbol No.	Part No.	Description
COILS & TRANSFORMERS		
L001	22292078	Coil, FM, Antenna
L002	22294407	Coil, FM, RF
L003	22295116	Coil, FM, Oscillator
L004	22291082	Coil, 2.2μH
L101	22241050	Coil, 18μH
L102	22291082	Coil, 2.2μH
L103	22241024	Coil, 22μH
L104	22291082	Coil, 2.2μH
L105	22242832	Coil, MW/LW, Antenna
L106	22232219	Coil, 8.85mH
L107	22291082	Coil, 2.2μH
T101	22265727	IF Transformer, FM
T102	22267349	IF Transformer, FM
T103	22245358	Coil, MW, Oscillator
T104	22205055	Coil, LW, Oscillator
T105	22264757	IF Transformer, AM
T106	22266326	IF Transformer, AM
⚠ T901	22223898	Power Transformer
ELECTRICAL PARTS		
J001	22162468	Terminal, 4P, Antenna
J301, 302	22163831	Jack, US4P, Phono/Aux/Tape 1-2
J501	22162475	Terminal, Speaker
J502	22163744	Jack, 6ϕ, Headphone
S401	22195726	Switch, Push, Aux
402		Phono
403		FM
404		MW
405		LW
406		Tape
407		FM Muting/ Mono
408		Loudness
⚠ S901	22195631	Switch, Push, Power
Z101, 102	22153107	Filter, Ceramic, 10.7MJ
Z103	22153118	Filter, Ceramic, SFZ457A
Z201, 202	22153078	Filter, MPX
⚠ F501, 502	22144330	Fuse, 2.5A/250V
⚠ F901	22144357	Fuse, T 1.2A/250V
N001	22113490	Lamp, 14V, 50mA, Pointer
E001	22165036	Holder, Fuse, 2A
E002	22165076	Holder, Fuse, 1.2A
E003	22162338	Terminal, Ground
⚠ E004	22176286	Cord, Power Supply

Symbol No.	Part No.	Description
CAPACITORS C = ±0.25pF, D = ±0.5pF, K = ±10%, M = ±20%, Z = +80 −20% ABBREVIATIONS: CD = Ceramic Disk, EL = Electrolytic MY = Mylar Film, PP = Polypropylene Film		
C01, 03, 05, 08, 09	22308202	Variable, VC-5-335
C06, 11, 12	22309131	Trimer
C07, 10	22309158	Trimer
C001	22360314	CD, 10pF, 50V, D (TH)
C002	22349101	CD, 100pF, 50V, K
C004	22360158	CD, 15pF, 50V, J (TH)
C005	22361609	CD, 6pF, 50V, D
C006	22349101	CD, 100pF, 50V, K
C007	22342223	CD, 0.022mfd, 50V, Z
C008	22342223	CD, 0.022mfd, 50V, Z
C009	22362100	CD, 10pF, 50V, K
C010	22360091	CD, 22pF, 50V, J (RH)
C011	22360074	CD, 0.5pF, 50V, C
C012	22360310	CD, 10pF, 50V, D (CH)
C013	22360137	CD, 39pF, 50V, J (CH)
C014	22342223	CD, 0.022mfd, 50V, Z
C015	22360314	CD, 10pF, 50V, D (TH)
C016	22342223	CD, 0.022mfd, 50V, Z
C101	22342223	CD, 0.022mfd, 50V, Z
C102	22342223	CD, 0.022mfd, 50V, Z
C103	22342473	CD, 0.047mfd, 50V, Z
C104	22342223	CD, 0.022mfd, 50V, Z
C105	22342223	CD, 0.022mfd, 50V, Z
C106	22342223	CD, 0.022mfd, 50V, Z
C107	22488338	EL, 0.33mfd, 50V
C108	22488339	EL, 3.3mfd, 50V
C109	22342223	CD, 0.022mfd, 50V, Z
C110	22342223	CD, 0.022mfd, 50V, Z
C111	22349221	CD, 220pF, 50V, K
C112	22349331	CD, 330pF, 50V, K
C113	22342223	CD, 0.022mfd, 50V, Z
C114	22342223	CD, 0.022mfd, 50V, Z
C115	22488478	EL, 0.47mfd, 50V
C116	22342103	CD, 0.01mfd, 50V, Z
C117	22360029	CD, 10pF, 50V, J (UJ)
C118	22321050	PP, 360pF, 50V, J
C119	22360029	CD, 10pF, 50V, J (UJ)
C120	22321084	PP, 180pF, 50V, J
C121	22360186	CD, 82pF, 50V, K (UJ)
C122	22342223	CD, 0.022mfd, 50V, Z
C123	22342223	CD, 0.022mfd, 50V, Z
C124	22342103	CD, 0.01mfd, 50V, Z
C125	22362470	CD, 47pF, 50V, K
C126	22342103	CD, 0.01mfd, 50V, Z
C127	22342103	CD, 0.01mfd, 50V, Z

Symbol No.	Part No.	Description
C128	22488108	EL, 0.1mfd, 50V
C129	22488339	EL, 3.3mfd, 50V
C130	22488109	EL, 1mfd, 50V
C131	22342223	CD, 0.022mfd, 50V, Z
C132	22488479	EL, 4.7mfd, 50V
C151	22343472	CD, 0.0047mfd, 50V, M
C152	22343472	CD, 0.0047mfd, 50V, M
C153	22485101	EL, 100mfd, 10V
C154	22488479	EL, 4.7mfd, 50V
C155	22488108	EL, 0.1mfd, 50V
C156	22485220	EL, 22mfd, 16V
C201	22488478	EL, 0.47mfd, 50V
C202	22488478	EL, 0.47mfd, 50V
C203	22488228	EL, 0.22mfd, 50V
C204	22321057	PP, 1000pF, 50V, J
C205	22488109	EL, 1mfd, 50V
C206	22485221	EL, 220mfd, 16V
C211, 212	22371562	MY, 0.0056mfd, 50V, J
C213, 214	22488479	EL, 4.7mfd, 50V
C215, 216	22488479	EL, 4.7mfd, 50V
C217, 218	22488479	EL, 4.7mfd, 50V
C301, 302	22468479	EL, 4.7mfd, 50V, Z (LS)
C303, 304	22485470	EL, 47mfd, 16V
C305, 306	22371222	MY, 2200pF, 50V, J
C307, 308	22371822	MY, 8200pF, 50V, J
C309, 310	22468479	EL, 4.7mfd, 50V, Z (LS)
C315	22342473	CD, 0.047mfd, 50V, Z
C316	22342223	CD, 0.022mfd, 50V, Z
C317, 318	22342223	CD, 0.022mfd, 50V, Z
C319	22488109	EL, 1mfd, 50V
C320	22342223	CD, 0.022mfd, 50V, Z
C403, 404	22349221	CD, 220pF, 50V, K
C405, 406	22371393	MY, 0.039mfd, 50V, J
C407, 408	22488479	EL, 4.7mfd, 50V
C501, 502	22349331	CD, 330pF, 50V, K
C503, 504	22371393	MY, 0.039mfd, 50V, J
C505, 506	22362330	CD, 33pF, 50V, K
C509, 510	22483470	EL, 47mfd, 10V
C511, 512	22485330	EL, 33mfd, 16V
C513, 514	22371272	MY, 0.0027mfd, 50V, J
C515, 516	22371223	MY, 0.022mfd, 50V, J
C517, 518	22485330	EL, 33mfd, 16V
C519, 520	22371153	MY, 0.015mfd, 50V, J
C521, 522	22371683	MY, 0.068mfd, 50V, J
C701	22488479	EL, 4.7mfd, 50V
C702	22342223	CD, 0.022mfd, 50V, Z
C703, 704	22342223	CD, 0.022mfd, 50V, Z
C705, 706	22342223	CD, 0.022mfd, 50V, Z
C707	22488109	EL, 1mfd, 50V
C708	22485330	EL, 33mfd, 16V
⚠ C901	22486222	EL, 2200mfd, 25V
C902	22486221	EL, 220mfd, 25V
C903	22486221	EL, 220mfd, 25V

Symbol No.	Part No.	Description
C904	22486221	EL, 220mfd, 25V
⚠ C905, 906	22440356	EL, 4700mfd, 35V
C907, 908	22486221	EL, 220mfd, 25V
C909	22488479	EL, 4.7mfd, 50V
C910	22485331	EL, 330mfd, 16V
C911	22487100	EL, 10mfd, 35V
⚠ C913	22488109	EL, 1mfd, 50V
⚠ C915	22340150	CD, 0.0047mfd, 400V, M
C917, 918	22342473	CD, 0.047mfd, 50V, Z
C919	22342223	CD, 0.022mfd, 50V, Z
C920	22342473	CD, 0.047mfd, 50V, Z
C921	22342223	CD, 0.022mfd, 50V, Z

RESISTORS

All resistors are carbon film ¼W, ±5%, unless otherwise noted. K = 1000, M = 1000000

R001	22555105	1M ohm
R002	22555220	22 ohm
R004	22555103	10K ohm
R005	22555332	3.3K ohm
R006	22555332	3.3K ohm
R009	22545154	150K ohm
R010	22555103	10K ohm
R011	22545182	1.8K ohm
R012	22555103	10K ohm
R013	22555472	4.7K ohm
R014	22555101	100 ohm
R101	22555331	330 ohm
R102	22555561	560 ohm
R103	22545332	3.3K ohm
R104	22555331	330 ohm
R105	22555101	100 ohm
R106	22555331	330 ohm
R107	22555331	330 ohm
R108	22545154	150K ohm
R109	22555473	47K ohm
R110	22555333	33K ohm
R111	22658495	100K ohm, B, Semi-fixed
R112	22555222	2.2K ohm
R114	22555562	5.6K ohm
R115	22555222	2.2K ohm
R116	22555223	22K ohm
R117	22555104	100K ohm
R119	22545473	47K ohm
R120	22545473	47K ohm
R121	22555562	5.6K ohm
R122	22555103	10K ohm
R125	22555102	1K ohm
R126	22555333	33K ohm
R127	22555333	33K ohm
R128	22555102	1K ohm
R129	22555562	5.6K ohm

Symbol No.	Part No.	Description
R130	22555472	4.7K ohm
R131	22555104	100K ohm
R132	22555103	10K ohm
R133	22555683	68K ohm
R134	22555102	1K ohm
R136	22555104	100K ohm
R153	22555472	4.7K ohm
R154	22555683	68K ohm
R155	22555153	15K ohm
R156	22545154	150K ohm
R157	22555103	10K ohm
R158	22555472	4.7K ohm
R201	22555102	1K ohm
R202	22555103	10K ohm
R203	22658257	10K ohm, B, Semi-fixed
R204	22555473	47K ohm
R205	22555334	330K ohm, Q201 TA7323P-RED
	22555154	150K ohm, Q201 TA7323P-ORG
	22555104	100K ohm, Q201 TA7323P-YEL
	22555823	82K ohm, Q201 TA7323P-GRN
R206	22555104	100K ohm
R207	22555104	100K ohm
R208	22555222	2.2K ohm
R211	22555332	3.3K ohm
R212	22555332	3.3K ohm
R213, 214	22555104	100K ohm
R215, 216	22555564	560K ohm
R217, 218	22555103	10K ohm
R219, 220	22555472	4.7K ohm
R221, 222	22555681	680 ohm
R223	22555123	12K ohm
R301, 302	22555104	100K ohm
R303, 304	22555101	100 ohm
R305, 306	22555104	100K ohm
R307, 308	22555561	560 ohm
R309, 310	22555333	33K ohm
R311, 312	22555394	390K ohm
R313, 314	22555102	1K ohm
R315, 316	22555221	220 ohm
R401, 402	22555332	3.3K ohm
R403, 404	22545682	6.8K ohm
R405	22628028	100K ohm, B, Variable
R407, 408	22555123	12K ohm
R409, 410	22555102	1K ohm
R411, 412	22555101	100 ohm
R413	22628027	250K ohm, W, Variable
R501, 502	22555563	56K ohm
R503, 504	22555101	100 ohm
R505, 506	22555561	560 ohm

Symbol No.	Part No.	Description
R507, 508	22555223	22K ohm
R511, 512	22555105	1M ohm
R513, 514	22555561	560 ohm
R517, 518	22555181	180 ohm
R519, 520	22555103	10K ohm
R521, 522	22555101	100 ohm
R523, 524	22555101	100 ohm
R525, 526	22658491	300 ohm, B, Semi-fixed
R527, 528	22555101	100 ohm
R529, 530	22555101	100 ohm
R531, 532	22570264	150 ohm, 1W, Metal Oxide Film
⚠ R533, 535	22500186	0.22 ohm, 3W, Wire Wound
⚠ R534, 536	22500186	0.22 ohm, 3W, Wire Wound
R539, 540	22555333	33K ohm
R541, 542	22555103	10K ohm
R543, 544	22555681	680 ohm
R545, 546	22555223	22K ohm
R547, 548	22555561	560 ohm
R549, 550	22620031	100K ohm, C, Variable
R551, 552	22555102	1K ohm
R553, 554	22555223	22K ohm
R555, 556	22555472	4.7K ohm
R557, 558	22620031	100K ohm, C, Variable
R559, 560	22555104	100K ohm
R561, 562	22570266	220 ohm, 1W, Metal Oxide Film
R701	22555223	22K ohm
R702	22555223	22K ohm
R703	22555223	22K ohm
R704	22555102	1K ohm
R705	22555103	10K ohm
R706	22555333	33K ohm
R707	22555683	68K ohm
R708	22555103	10K ohm
R709, 710	22555102	1K ohm
R711, 712	22555102	1K ohm
R713	22555102	1K ohm
R715	22555682	6.8K ohm
⚠ R901	22500202	2.2 ohm, ½W, Fusible
R902	22545561	560 ohm
R903	22545561	560 ohm
⚠ R904	22570270	470 ohm, 1W, Metal Oxide Film
⚠ R905	22570270	470 ohm, 1W, Metal Oxide Film
R907	22555104	100K ohm
R908	22555103	10K ohm
R909	22555103	10K ohm
R911	22555152	1.5K ohm
R912	22570274	1K ohm, 1W, Metal Oxide Film
R913	22555103	10K ohm
R914	22545123	12K ohm

Symbol No.	Part No.	Description
ACCESSORIES		
	22124701	Feeder Ass'y, Antenna
	22902906	Owner's Manual (English)
	22902907	Owner's Manual (German)